

Using Visuals

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Visuals in text should work with the text and should not confuse the reader in any sense. Remember that they are *a part of your writing*; treat them as such.

[Helpful Hints for Creating and Placing Effective Visuals](#)

- Always be sure that your visual says something that is important to your "story," be it a scientific investigation, a psychological experiment, or a diagram of an engine part. It is critical that your reader/viewer be able to understand the figure or table *in isolation from the text* if necessary.
- Always introduce your material appropriately in the text. Refer to the figure or table (e.g., See Figure 1) clearly in the text, and make sure the visual appears in a logical place, somewhere above or below your reference. Save appendices for information only a *very* interested reader might want to see; for your general audience, place all information in an accessible location.
- Always present the information as clearly and as simply as you can, and in a way that makes viewing it seamless to your reader. Remember that just because your software package allows you to create complex visuals doesn't mean you should do it.
- Always present clear numbers and labels on both tables as figures. Some publications will allow you space under the figure heading to discuss odd or interesting details about the figure.
- Always cite your reference source for borrowed or modified visuals, be they tables or figures. As with borrowed or modified text, un-cited visuals carry the risk of plagiarism charges. Journals will have their own procedure for obtaining permission to use previously published visuals.
- Always double-check your work: Be sure that your visual isn't repeating exactly what your text has just said, and be even more sure that your visual says everything you promise in your text.
- Never use your graphic to distort your data; lying with graphics can get you into serious trouble!

Some practical reminders:

- When multi-colored graphs are photocopied with standard black & white copiers, all colors become some shade of gray. If you can use contrasting textures instead of or in addition to the colors, do so. (This will depend on your purpose and publication.)
- Figures, especially scanned images, can make an exceptionally large computer file; be careful before e-mailing it to someone. You should also recognize that figures may require a separate disk.

Effective Visuals: Tables vs. Figures, and How Best to Present your Data

While most people are familiar with the basic principles of designing tables and graphs, they often forget the basic goal behind providing information in a visual form. As a consequence, writers may include visuals that simply repeat information already in the text or they may include visuals that stray so far from the text that the reader gets confused. Writers need to remember that *the goal of visual information is to enhance the text, and in so doing provide the reader with an easy way to access a large amount of information within a small space.* A good graphic will provide both a visual break from the flow of text, as well as a new way of looking at the information being discussed. The aim is to help the reader better conceptualize an idea in a way that words simply cannot allow. In short, visual information should help the writer tell his or her "story," and in so doing, should help the reader understand that story.

Two of the most common ways of presenting visual information is through *tables* and *figures*. Figures include anything that is not a table -- graphs, photographs, diagrams, any sort of visual information. When you begin telling your "story," you need to decide how best to present your data, whether in a table or a figure. The following two examples help illuminate how recasting your data can tell a completely different story:

[Insert Table 2: Blood Glucose Levels]

While this table provides data that may be important to some readers, it fails to make accessible the drastic variation between the blood glucose levels of a normal individual and a diabetic throughout the day. When we place the same data into a graph, we get a very clear picture of these differences.

[Insert Figure 2. Blood glucose level for normal individual and diabetic. Originally taken from Carolson, Gary, "Implantable Insulin Delivery System," *Sandia Technology*, vol. 6, no. 2 (June 1982), pp. 12-21. And presented in Michael Alley's *The Craft of Scientific Writing*, pp.148-149 (3rd edition, Springer-Verlag, 1996).]

The visual "story" that the graph presents quickly shows the blood glucose level peaks that a diabetic experiences after meals; however, it also provides necessary data points that may be useful to other readers.

When we consider the differences between these two examples, we see that, as writers, presenting information in different ways can help us think about our own interpretation of our

own ideas. Once those ideas are solidified, we can then provide clear, concise visuals for our readers.

*Table and figure taken with permission from Michael Alley's *The Craft of Scientific Writing*, pp.148-149 (3rd edition, Springer-Verlag, 1996).

Chartjunk

One trap that writers often fall into is including "chartjunk" in their graphics. Chartjunk refers to all the extra bells and whistles such as grid lines, data points, and such that can be included in a graph. The problem often stems from a combination of writers wanting to make sure they have enough information, and design software allowing users to do anything they want. Just because you can do it, doesn't mean you should! Microsoft Word, for example, starts its user off with a 3-D bar graph as a default; in most cases, a 2-D graph would work just as well. If we compare Figures 1 and 2, can see how even simple chartjunk can get in the way of the reader's view of the data.

[Insert Figure 1 --- Chartjunk2]

Figure 1 includes chartjunk, such as 3-D bars, data points on each bar, and too many grid lines. If we clean it up, we get Figure 2:

[Insert Figure 2 --- Nochartjunk]

As we can see, Figure 2 is simple, clear, and easy to read.

The lesson here? For basic graphs, keep things basic. Your aim is to convey information, not to impress your reader with your design skills. Save the fancy graphics for presentations, but even then, don't go overboard.

Useful References

Edward Tufte provides possibly the most creative and most expansive selection of material about graphics and visuals. The following three books are available on-order at most bookstores, and are also housed at U of T's Robarts Library.

The Visual Display of Quantitative Information, Graphics Press, Cheshire, CT. 1983. In this book, Tufte discusses *pictures of numbers*; how to depict data and enforce statistical honesty. Through numerous historical examples, he shows how to avoid issues such as "chart-junk" and how to create the most clear and efficient -- yet elegant -- graphic as possible.

Envisioning Information, Graphics Press, Cheshire, CT. 1990. This text explores issues of *envisioning nouns* (such as maps), as well as certain issues in visual design, such as color and object interaction. His analogy of a map as a visual enforces the idea that good graphics should provide information on both a macro and a micro level.

Visual Explanation, Graphics Press, Cheshire, CT. 1996. This text explores issues of *envisioning verbs*. Throughout his examples, Tufte discusses how these "pictures of verbs" show cause and effect, processes, mechanisms, and how they ultimately explain and narrate an action. As with his other texts, Tufte is careful to remind the reader of the importance of truthfulness is both the content and design.

Another good reference book for creating more basic graphics and visuals is *The MIT Guide to Science and Engineering Communication*, by James G. Paradis and Muriel L. Zimmerman. (The MIT Press, Cambridge, MA. 1997.)

[Types of Visuals: A Quick Reference Guide](#)

- Graphs display relationships between two or more sets of data.
 - *Line Graphs* show the relationship between two values represented by intersecting values projected from the horizontal & vertical axes on a coordinate grid. Common use for line graphs is to plot changes in quantity, showing exact increases or decreases over time.
 - Use the horizontal axis to depict time.
 - Limit the number of lines on one graph.
 - When using more than one line, differential the lines by design or color.
 - Use a key or label to identify each line.
 - Keep the vertical and horizontal axes proportionate.
 - *Pie Graphs* emphasize the proportionate distribution of something – frequently money or time. Pie graphs are 100% graphs, where each percent represents 3.6° of the circle. Generally, slices of the pie are arranged from largest to smallest, starting at "noon" and moving clockwise.
 - *Bar Graphs* show comparisons, trends, and distributions. Bar graphs are drawn from a series of values plotted on two axes, but values represented by vertical or horizontal bars instead of points joined by a line. Each bar represents a separate quantity; consequently, they are good for representing data of distinct units.
 - Make bars the same width.
 - Make the space between the bars one-half the bar width.
 - Label each bar.
 - *Pictorial Graphs* use actual symbols to make up each bar (they're a version of the bar graph). The problem with pictorial graphs is that it's difficult to show fractions.
 - Round off all numbers to eliminate fractions.
 - Make all symbols the same size and space them equally.
 - Select symbols that are clearly representative of the object.

- *Charts* can represent the components, steps, or chronology of an object, mechanism, organism, or organization.
 - *Block component charts* represent components or subdivisions of the whole object.
 - *Organizational charts* show the hierarchy of an organization; there are vertical and horizontal relationships in the organization.
 - *Flowcharts* depict the sequence in steps in a process.

- *Diagrams* illustrate the complex physical components and structures of objects, mechanisms, or organisms. The benefit of diagrams is that they allow specific information to be shown (as opposed to a photograph, which would show everything.)

- *Drawings* depict actual appears of the object or organism. There is a freedom of emphasis with drawings; the artist has the ability to delete or emphasize important features.

- *Maps* can show anything from geographic information to topographic, demographic, agricultural, or meteorological data.

- *Photographs* provide the most realist view of a subject, and should be used when you want to emphasize realism.

- *Tables* show numerical or topical data in rows and columns, thus providing readers with quick access to quantitative information and allowing readers to easily make comparisons among items.

General guidelines for setting up tables:

0. Provide a heading for each column that identifies the items in the column.
1. Use footnotes to explain specific items in columns. Footnotes for specific numbers or columns require lowercase superscript letters (e.g., ^{a,b,c}). If the footnote is for a specific number place the letter directly after the number (e.g., 432^a). List all footnotes at the left margin of the table, directly below the data.
2. Space columns sufficiently so that the data do not run together.
3. Give the source of your data below the table. If you have multiple sources and have compiled the information into a table, explain this in the text, if necessary.
4. Use decimals and round numbers to the nearest whole number.
5. Indicate in the column heading if you are using a particular measure for units, such as "millions of dollars" or "per 5000 barrels."

Regarding the placement of title/labels for graphics:

Tables have their labels on the *top*, and figures have their labels on the *bottom* of the graphic.

A Few Things to Remember about Visuals

- Keep visuals simple. Too much detail confuses and distracts the reader.
- Never interrupt a sentence with a visual.
- Label all visuals (number and title).
- Make reference to visual(s) within the text.

To show:	Use:
What something looks like	photograph, diagram, or illustration
Where something is located	map
How something is put together	exploded view (diagram)
How one thing varies in function from something else	graph
Proportions and percentages	pie chart
Comparisons between quantities	bar graph
A body of related data	table

As viewers, we expect:

- Written information to follow from left to right, top to bottom. (Page design)
- Information in the centre/foreground to be more important than the information on the periphery/background. (Page design.)
- Large or thick things to be more important than small or thin things.
- Things with the same size, shape, location or color to be related to each other.

*The majority of this information has been paraphrased or taken directly from Rebecca Burnett's *Technical Communication* (Third Edition), 1994.